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# China Report

SCIENCE AND TECHNOLOGY

No. 207



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21 September 1983

CHINA REPORT  
SCIENCE AND TECHNOLOGY

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## APPLIED SCIENCES

### INVENTORS RECEIVE AWARDS IN SCIENCE, TECHNOLOGY

OW161339 Beijing XINHUA in English 1301 GMT 16 Aug 83

[Text] Beijing, 16 Aug (XINHUA)--China's State Science and Technology Commission has given national awards to 59 major inventions this year. It was announced by the spokesman of the commission Wu Xing at a news briefing here today.

One was given a first-class award, 6 second-class, 30 third-class, and 22 fourth-class.

Top award was given to a fine soybean strain developed through sexual hybridization, radiation processing and many generations of directive breeding by the Tieling Prefectural Agricultural Research Institute in Liaoning Province. The strain is grown on more than 2.2 million hectares of farmland. It produced an additional yield of 550,000 tons of soybeans in the past ten years.

The technique of ion infiltration of nitrogen, carbon and titanium to grey cast iron developed by Yang Lieyu of the Dalian Institute of Ocean Shipping was given a second-class award. It is a new titanium adding methodology and technique. Service life of grey-iron castings such as piston shields and piston rings treated with this technique is 2 to 10 times longer than chrome-plated ones.

A third-class award went to Li Yunlong of the Anhui Institute of Chinese Medicine. He invented a method for identifying snake species through restraining the agglutination of the antigen and antibody of the venom of a snake bite within 8 minutes. This usually takes 3 to 10 hours. The method is more than 95 percent accurate.

Another third-class award winning invention is a cataract extractor developed by No 44 Hospital under the Kunming army units. This special instrument can remove cataract capsules caused by old age, trauma and congenital defects and other ailments. The charge is less than 1/10,000th of the method of freezing widely used abroad.

Other award winning inventions included a method for preventing and treating aeronautical otitis, a new medicine for chronic hepatitis called dibenzoester, and a new anti-tuberculosis medicine called rifudin.

Wu Xing said China gives both commendation and monetary awards for outstanding inventions in science and technology. The first-class award winner receives 10,000 yuan, second-class 5,000, third-class 2,000 and fourth-class 1,000. The Chinese Government has awarded 487 inventions since 1979.

## APPLIED SCIENCES

### NEAR-TERM DEVELOPMENT OF INDUSTRIAL BOILERS STUDIED

Shanghai DONGLI GONGCHENG [POWER ENGINEERING] in Chinese No 2, 1983 pp 29-34

[Article by Shi Qiangsun, Shanghai Industrial Boiler Research Institute]

[Text] This article stresses the varieties, standards, qualities and scientific research developments of industrial boilers and indicates the direction of future endeavors.

#### I. Development in Recent Years

The Central Government's policy for solving the nation's energy problems is to view "exploiting and economizing as equally important. In the short term, 5 to 7 years, energy conservation is the first priority." Energy conservation is a national strategic policy. Industrial development depends upon energy; energy development cannot be achieved in a short period. Judging from the current situation, there will not be any large-scale energy increase from now until 1985. Thus, high-energy-consumption equipment must take effective measures to heighten efficiency. Industrial boilers are numerous and widely used. Related departments pay attention to the energy conservation of these industrial boilers because they use large amounts of fuel. At the same time, the product quality and especially the safety reliability of the industrial boilers is of special importance. Long-term high efficiency and steady operation can only be guaranteed with high-quality products.

In recent years, China's industrial boilers have been improved in varieties, standards, quality, and scientific research. These improvements have satisfied the needs of the various sectors of the national economy. The development of these areas will be described:

##### 1. Variety

During the 15 years from the early 1950's to the mid-1960's, China's industrial boiler types were primarily copied from foreign countries: for example, the British Cochran [5072 0344 5695], Lancashire, and Babcock [2328 4101 5514 6433], connected-chamber style, and the Stirling bent-tube type, and the Soviet Union's K and AKB types. The country started to have its own designs after the mid-1960's. The typical structure of Chinese-designed products starts from 0.2 ton/hour to 20 ton/hour. They are the vertical-water tube

boiler, fire-tube fast-installation boiler, two-longitudinal-drum tube boiler, and the two-lateral-drum tube boiler. All of these typical products have been used since the early seventies.

The fuel coal for industrial boilers from the 1950's to the 1960's was mainly high-grade bituminous coal. The heating value of high-grade coal is over 5,000 Kcal/kg. For boilers with a capacity smaller than 1 ton/hour the operating heat efficiency is about 50-55 percent; for 1-2 tons/hour it is about 55-60 percent; for 4 tons/hour it is about 65-70 percent; and for over 6 tons/hour the efficiency is above 70 percent. Starting in the 1970's, coal supplies were tightened and the quality of the fuel coal was lowered. As a result, the users of industrial boilers began to carry out furnace remodeling projects one after another. Many of the boilers produced by the manufacturing plants that were originally designed to use high-grade coal were modified directly after they were shipped to the users. The Materials Supplying Department placed emphasis on burning low-grade coal so the trend to modify the boilers was widespread. After 1976 the industrial boiler manufacturing plants under leadership at higher levels attempted to develop boilers that used low-grade coal. The heating value of low-grade coal is between 1,300 Kcal/kg and 3,700 Kcal/kg. In 1979 there were 56 types of industrial boilers that burned low-grade coal: there were 30 boiling boilers, 8 pulverized-coal boilers, 9 reciprocating boilers, 6 chain boilers, 2 vibration boilers, and 1 fixed-grate boiler. Twenty-eight of these had satisfactory or good user response. By the end of 1980 there were 980 boiling boilers which produced a total of 6,181 steam-tons. The other 281 pulverized-coal-burning boilers produced a total of 2,595 steam-tons.

The primary problem in developing the boiling boiler was the stabilized operation problems followed by efficiency and environmental protection. In the developmental process the following problems existed: (1) Boiling boilers have a specific requirement for the granularity of fuel coal. In general, when it is between 2 and 8 mm it will give a higher efficiency. The current supply of auxiliary machinery for breaking, sifting and transporting the coal supply has not kept up with the needs of the users. Many boiling boiler stockpiling yards we have seen have a lot of coal dust and the working conditions were very poor. (2) The operation of boiling boilers requires higher standards. All types of monitoring instruments and meters and remote control facilities must be built and installed. Otherwise, the fire could easily be extinguished or there could be a problem with slag coagulation in the furnace. (3) The exhaust has a high dust content so the high-efficiency dust remover must be installed. (4) Slag discharged from the furnace must be comprehensively utilized. In the development of boiling boilers for industrial users the primary problem which needs to be solved is that of supply and transportation costs of low-grade coal, and secondly, the question of multipurpose use of ashpit refuse.

The reciprocating grate developed in recent years was used for burning this low-grade coal. The primary reason for its widespread application was because the grate lowered the amount of dust in the exhaust; thus, the environmental protection agencies supported this product. Secondly, the reciprocating boiler is easy to remodel, has a simple transmission, and is simple to operate.

Its fuel has a wide adaptability. Experiments show that after several measures have been taken, the energy heating values of low-grade coal reached 2,700 Kcal/kg for materials with a volatile substance that is greater than 30 percent. However, there are currently two problems existing in the reciprocating boilers that have not been properly resolved: (1) boiler grates burning in the high-temperature zones; (2) coal leakage problems.

The industrial boilers developed between 1976 and 1979 using low-grade coal actually filled the void of China's industrial boiler industry, thereby making a contribution to industry.

After 1980 the coal supply situation changed. In general, the coal quality improved. The Materials Supplying Department applied the coal supplying policies to the large- and medium-sized industrial boilers in cities such as Shanghai, Beijing, and Tianjin which have a heating value close to 5,000 Kcal/kg. Considering the vast territory of China, there are differences in coal qualities. Under the circumstances, the policy on coal for motive power cannot be easily determined. In order to satisfy the users' needs along with the development of low- and high-grade boilers, the decision was made to develop an industrial boiler that utilizes medium-grade coal (type-II bituminous coal). Different kinds of boilers for different coal grades enable the users to choose the type of boiler to fit their available grade of coal. In 1980 under the leadership and organization of the General Electrical Engineering Bureau, a joint design was developed for a product series of 17 types of medium-grade coal boilers. In June 1982 five specifications were completed. By the end of 1983 all models will be completed. Among the joint design products of medium-grade coal boilers were two kinds of manual-burning coal furnaces: 0.2 ton/hour and 0.5 ton/hour. One is called the bright flame reverse burning method and the other is called the double-chamber grate boiler. The bright flame reverse burning method adopts a thick coal layer with secondary air above it. The burning surfaces cover from top to bottom. Since it is not necessary to open the boiler doors often there is no black smoke exhaust. This method satisfies the environmental protection requirements. Heating efficiency is about 62 percent. The disadvantage of this burning method is that it cannot be operative for a long period: ashes in the furnace must be removed every 4 hours. The double-chamber grate boiler has two sets of boiler grates. The larger pieces of coal will be burned on the upper layer boiler grates and the slack and the small pieces of coal fall to the lower chamber where they burn. In the burning chamber, the temperature is higher; the flames go from the upper chamber boiler grates through the lower boiler grates. New coal is added on top of the red-hot coals on the upper chamber boiler grates and the vaporized materials will be burned through the flames. Thus, there is no black smoke exhaust problem as in the manual burning boiler when the doors are opened. The coal chamber burning is more complete and the heat efficiency is 66 percent because the double chamber boiler grates apply only drafts, not blast air.

All the joint design products of the medium-quality coal boilers with the capacity of 1 ton and over use chain grates. The heat efficiency of varied capacities is anywhere from 1 to 3 percent higher than the standard requirements prescribed by the ministry.

After the medium-quality coal boiler series is completed, China's industrial boiler manufacturing industry can provide 12 kinds of products that can burn bone coal, gangue, anthracite (three types), lignite, lean coal, bituminous coal (three types), and oil and gas.

## 2. Standards and Quality

The product quality of the industrial boilers relates closely to management, work standards, and inspections. From the early 1950's to mid-1960's China's boiler standards followed those of the Soviet Union and Czechoslovakia. During that period of time, the manufacturing plants had a definite inspection system. Thus, the product's quality was insured. After 1966 the standardization projects collapsed. The inspection sections were assigned to the workshops and the quality of products declined. In 1973 the First Ministry of Machinebuilding Industry started to control the quality of products again, and requested that the industry resume the formulation and revision of the standardization projects. Starting in 1974 the industrial boiler departments organized an industrywide standardization system, revision program, and long-term plans. Up until the end of 1975, revision work on 18 ministry-approved manufacturing technology standards was completed. In 1976 four standards on the spare parts for furnace doors were revised. From 1977 to 1980 the industrial boiler installation standards, the low-pressure boiler water quality standards, and the industrial steam boiler parameter series standards, and the shell boiler strength calculation standards were revised. The industrial boiler thermal engineering tests and industrial boiler products technological requirements, totaling more than 10 important basic standards, the 2 technical guidance documents, the industrial boiler thermodynamic calculation techniques guide and the industrial boiler interior design guide, were formulated. These 30 or more standards enable the industrial boiler industry to have a more complete standardization system. More recently due to the emphasis placed on standardization by the leadership of the ministry and bureau, the factory leaders have been emphasizing standards and product quality. Now the industrial boiler manufacturing plants have all established inspection or quality control sections to carry out quality supervision, conduct welders' tests and strengthen the physical and chemical tests and the nondestructive inspection of material.

## 3. Scientific Research

Combustion, automatic control, water treatment and dust removal are explained as follows: (!) The experimental research of the combustion equipment plays an important role in the scientific research of industrial boilers. There are numerous special articles that discuss the industrial boiling boilers so they will not be repeated here. The most commonly used combustion mechanism among the industrial boilers operating in China is the chain grate. Although chain grates have a long history, China has not done sufficient research in this area. One important turning point in the historical development of the chain grate is the change from general chamber drafts to separate chamber drafts. The chain grate's combustion efficiency and adaptability to the use of different kinds of coal were increased greatly by the adoption of separate chamber drafts.

Currently, the domestically produced small chain grate adopts separate chamber drafts in form. However, the designed structure has defects and it does not have the effects of separate chamber drafts. There are no test data to determine either the quality or the quantity of drafts. Thus, the State Science and Technology Commission has placed emphasis on the experimental research on the sealing and air distribution of small chain grate boilers' draft chambers. It is initially estimated that the research will result in raising boiler efficiency by 2-3 percent.

(2) In recent years the smaller types of industrial boilers, those with the capacity of 2 tons/hour and under, have adopted the reciprocating grates. The advantage of this grate has been mentioned before; however, the major defect of this kind of grate is that the grate plate will burn out. In 1981 a massive temperature measurement project was carried out to measure the temperature of the grate plates. The temperature field distribution in the reciprocating grate plates was verified and steps were considered for the protection of the grate plates. This project is now under way. Reciprocating grates are usually of the tilt-ladder type. More recently the flat-shove reciprocating grate was developed. This flat-shove structure has an advantage over the tilt-level style in terms of the entire layout of the structure.

(3) For many years China has adopted the Soviet Union's "standard methods" for the boiler thermodynamic calculations. Coupled with the development of China's national economy, the emphasis of the industrial boiler designs was for wide application and high quality. The "standard methods" were too complicated and inconvenient as well as having inconsistencies in the inner boiler heat transfer basic equations. Now in the fuel classifications of industrial boiler types China is slowly developing her own independent systems; therefore, there is a crucial need for the drawing up of easier, more convenient industrial boiler thermodynamic calculation methods which are suited to China's own needs. Starting in 1978 the Industrial Boiler Institute organized the related higher education institutions' manufacturing plants and carried out experimental projects with them and edited the "Chamber Combustion and Boiling Industrial Boiler Thermodynamic Calculation Methods." Part of this work will be proven in actual practice and thereafter, it will be necessary to complete more testing and revision.

(4) Shell and tube boiler (that is, fire-tube boiler) and small water-tube boilers adopt a filler welding connection. It has the advantage of tight and sturdy structure, ease in manufacturing, and economizes materials. However, in China there has been insufficient research on this style of structure, so confidence in this structure's reliability is low. The Chongqing Boiler Plant and Chongqing University carried out a scientific research project on the former's WHS 4-8 style shell and tube boilers filler welding fatigue strength. They first theoretically applied the finite element method to make stress analyses and developed the following two types of experimental projects: (1) electrical stress test for normal to high temperatures. The stress field data of the filler welding area was measured at the starting moment and under operating conditions; (2) the total thickness, similar technology, same material fatigue test was China's first project that has technically proven the strength of the filler welding structure.

(5) The experimental projects of the automatic control instruments of industrial boilers were at a standstill after 1965. In 1979 the ministry assigned to the lower levels the scientific research project of oil-burning industrial boilers automatic control system. In 1980 in the course of the joint design of a medium-grade coal boiler, another joint design of the coal-burning chain grate was organized. In 1981 the Instrument and Meter Bureau called an industrial boiler automatic control systems typical design scheme appraisal conference. As a result of the enhanced relationship between the boiling manufacturing industry and the instrument and meter industry, the industrial boiler automatic control instruments have improved in recent years. In the water level warning and adjustment mechanisms, not only has the double-position type been widely adopted, but it has also developed into the eight-connection-point continuous type and float-inductance type continuous feedwater mechanisms. The less expensive coal-measuring meter and the steam-flow-rate meter, based on the "Aniuba" [7093 3662 1572] theory, have all been successfully trial produced. Now there are well-developed instruments for measuring carbon dioxide, carbon monoxide, and oxygen contents, but their costs are high. The smoke-content-analyzing meter is the correction signal source of automatic combustion control. In order to conserve energy, lower cost specialized meters for industrial boilers must be developed so the combustion automatic control system can be popularized among the large-capacity and wide-surface industrial boilers. The proposed cost of automatic control meters should be held around 10 percent of the cost of the principal boiler. Now the DDZ-II type meter can function as the industrial boiler's automatic control system, but the total cost is around 45,000 yuan. That is to say, only when the boiler capacity is above 35 tons/hour will the DDZ-II meter become cost effective. Although recently a less expensive TA series has been developed, it needs to be tested further and then popularized. As seen from the automatic control meter of imported small-scale industrial boilers, the multiconnection points positional control of pressure gauges has been adopted and the coal feed rate of the chain grate is controlled by a timing relay. Boilers with a capacity of 10 tons/hour and under all adopt this kind of system which also functions as a furnace automatic start and shutoff mechanism and has a certain range of load regulations. In these areas, they function as references and learning tools for the industry. All in all, the automatic meters of the industrial boilers must be lasting and reliable, have a simple system, and must be low cost in order to become popular.

(6) The water treatment of the industrial boiler systems is still using the sodium ion exchange. In recent years, countercurrent regeneration and floating bed ion exchange have been developed. Although these products are now available, their specifications are incomplete. More recently there have been considerable developments in multiple valves. Now manual multiple valves and program-controlled multiple valves can be produced and supplied. What is more outstanding is the program-controlled multiple valve that is small and light; one program-controlled multiple valve can replace six cut-off valves necessary in a general system. This has created favorable conditions for realizing the full automation of water treatment systems for industrial boilers. Currently related departments are developing automatic hardness meters to go with the program-controlled multiple valve in striving for full automation.

11. The research and development of dust removers from industrial boilers have progressed in the last few years. The First Ministry of Machinebuilding originally specified that beginning in 1978 the ministry-designated plant must equip their industrial boilers with complete dust-removal equipment. Subsequently, various provinces and cities set up dust-removal manufacturing plants. With the cooperation of various research institutes, these plants have set up the trial production and development of dust removers. They have developed the more complete products such as XWD, XZD/G, XZZ-D, XS, XCZ, double-stage vortex, etc., some 20 kinds of products that have efficiency rates between 85 and 93 percent.

Current problems that must be solved include the need to test and evaluate the thermal conditions of existing dust removers and make rational suggestions regarding the necessary accessories for users to order.

In the thermal systems, related departments are conducting research regarding fireplate steam trap and heat storage devices.

#### II. Direction of Future Endeavors

Industrial boilers are one of the first major products to be manufactured in the course of the technological transformation in the machinebuilding industry during the 6th Five-Year Plan period. The direction of the industrial boiler plants should follow the general objectives of the technological transformation in the machinebuilding industry. The major objectives are: (1) upgrading of products and striving to approach or reach the international standards within 10 years; (2) increase marketable products, product varieties, and output; (3) raise the standards of technological and economic indicators.

1. In accordance with the requirements of the ministry and bureau, the trial production and appraisal of joint design products for medium-grade coal projects of various capacities must be completed before 1983. During the 6th Five-Year Plan period, progress must be achieved in promoting these medium-grade coal energy-saving products, serving the project to the end, consciously perfecting the industrial testing during the operating period, having a thorough understanding of the long-term operating thermal efficiency, speeding up hot-water boiler design and trial production work, especially in developing large-capacity hot-water boilers to satisfy future regional centralized heat supply demands, and adopting new technologies, and new techniques to develop large-capacity industrial boilers suitable for joint thermal-electric power generation. Following the demand of the "Three Era" (the eras of improvement, development, and research), it is necessary to develop new-type high-efficiency water tube boiler series with an emphasis on the 4-tons/hour capacity. The majority of the currently manufactured products are the large-capacity and wide-surface 2-4-tons/hour-water fire-tube fast-installation boilers, which have the advantages of easy manufacturing and low cost. After this kind of boiler is shipped to the construction site, the user does not need to assemble the major body; thus, it saves work and is convenient to use. The disadvantage is that the thick dust collected on the horizontal smokestacks cannot be cleaned with the dust blower when the machine is operating. This dust must be cleaned manually when the boiler is shut off and the smokestack is open; thus,

it requires a high degree of labor intensity. If the dust is not cleaned for a long time, the boiler output and efficiency will both drop and the lower part of the boiler is under high-temperature thermal radiation, making it unsafe. In the United States, the coal-burning boiler with the capacity of 10 tons/hour and under mostly adopted the water tube boiler. That kind of fire-tube boiler, originating in the United States, that heats the boiler directly is now obsolete. Thus, active development should be pursued on the high-efficiency "fast-installation" water tube boilers that are safe and highly reliable and have inside and outside surfaces that are easy to clean. This must be followed by work on the 4-tons/hour and 10-tons/hour series. Currently a large number of the 6-tons/hour and the 10-tons/hour boilers has been produced. This type of boilers adopts the double horizontal vapor drum (SHL) which was adopted from the 20-tons/hour and larger boilers from foreign countries. From the standpoint of materials consumption and processing costs, these boilers' costs are high. As for the 4-tons/hour to 10-tons/hour industrial boiler types, research should be classified as an important scientific project and conduct design analysis research to lay the foundation for further research.

Meanwhile there should be experimental research on the industrial boiler's heat efficiency measuring and testing technology. The goal is to complete the heat efficiency measuring and testing projects that will meet the standards and increase the precision of heat efficiency within a short period of time. This kind of fast measuring and testing technology is helpful in carrying out the heat efficiency measuring of large-capacity and wide-surface industrial boilers. The collection of these data is important for the remodeling of old boilers and the development of new products. Research is being conducted on the development of a testing machine which is the first step in a long march.

2. Do a good job on standards and quality control and actively adopt the international standards and international commonly used standards to increase the level of product quality. Currently plant leadership should understand the essence of adopting these international standards. To adopt international standards is not only the application of written regulations. What is more important is to understand that the adoption of international standards is to actually adopt advanced quality control systems applied in industrially advanced countries. That is, to raise and develop the standards of quality management. For example, American boiler manufacturers must apply for an inspection certificate for manufacturing. The first rule is that manufacturing plants must provide plant inspectors, and a plant quality control handbook which covers the American National Standard ASME Code (Boiler and Pressure Vessel Standards). Thus, to adopt international standards is first to adopt their advanced quality control methods. The Department of the Machinebuilding Industry and the Department of Labor personnel should carry out inspections of 202 boiler manufacturing plants. Plants that conform satisfactorily will be given certificates. This is the first step in controlling product quality. From this time on there is a plethora of work to be completed in adopting international standards.

3. The assembly projects have been improved in recent years, however, there are still problems, many of which are transbureau products. The complete scope

of industrial boilers should be controlled at first by standards. Meanwhile, close attention must be paid to the variety of specifications of the auxiliary machines and valves. As for the quality of fittings, such as the noise and the efficiency of pneumatic machines and the performance of safety valves, all need frequent coordination and cooperation in order to achieve complete assembly and satisfy the users.

4. With respect to the industrial boiler users, there must be training programs for boiler operators. The various enterprises in charge must coordinate with the local labor departments in conducting technical training for boiler operators at regular intervals, give annual examinations, and issue certificates to those who pass the tests. Boiler manufacturing plants must actively participate and take the initiative in coordinating the technical training programs.

5. Finally, it is necessary to gradually ascertain the guiding principle and policy for the industrial boiler fuel coal. Boiler performance and efficiency are closely related to the characteristics of fuel coal. China is a country with a vast territory and the quality of the coal varies a great deal in various places; the supply of coal, however, must be relatively stable and coal must be supplied gradually at fixed points. In order to achieve better cost effectiveness, the users must select and purchase from the manufacturers the suitable product variety in accordance with their use of certain types of coal. The manufacturing departments must further develop combustion research on the relationship between the coal quality and combustion mechanisms, boiler types and boiler arches, etc., based on the characteristics of coal. This type of combustion research on coal grades will also gradually improve the boiler interior processor designs. All of these efforts will enable China's industrial boilers to catch up with the international advanced standards in variety, performance, and quality.

12441  
CSO: 4008/120

APPLIED SCIENCES

BRIEFS

SATELLITE PHOTOS--Beijing, 7 August (XINHUA)--Photos taken by the satellite launched by China for scientific and technological research have played an important part in prospecting for oil and minerals among other projects. These photos have also been widely used in geological and seismological studies, measuring of high seas and the coastline, port and river course construction, mapping and topographical surveys as well as archaeological studies. The geological prospecting company of the Capital Iron and Steel Company in Beijing discovered seven areas with prospective mineral reserves by studying satellite photos and information from aerial surveys in cooperation with the remote sensing research section of the Changchun Geological Institute. Geologists from the Ministry of Metallurgical Industry found chromium and iron ores in Inner Mongolia with the aid of satellite photos. Such photos also helped ascertain the pattern of movement of mud-silt flows and their interaction in the Yellow, Luan He and Hai He Rivers in north China, thus providing valuable data for solving the silt problem in Tianjin's new harbor. Satellite photos also helped Chinese archaeologists see clearly the outline of the ruins of Yuanmingyuan, an imperial garden of the Qing Dynasty (1644-1911) in Beijing's northwestern suburbs, which was burned down by the invading Anglo-French forces in 1860. [Text] [OW071153 Beijing XINHUA in English 0806 GMT 7 Aug 83]

CSO: 4010/86

## SCIENTISTS AND SCIENTIFIC ORGANIZATION

### SICHUAN INSTITUTE REPORTS PROGRESS IN COMPUTERS, AUTOMATIC CONTROL

Chengdu SICHUAN RIBAO in Chinese 20 May 83 p 3

#### Article: "Striding into the World of Computers"

Text It is a small room, and under a subdued light all manner of instruments and microcomputers are lined up on tables, on the floor, and on shelves along the walls. This is Comrade Zhang Yuebing's 1728 2867 0365 laboratory and office. And it was here that we visited him.

Comrade Zhang Yuebing is 33 years old. He is very tall with a thin face, talks slowly in a thin voice, and gives the impression of sincerity and modesty.

I had heard that originally he was an artilleryman in the armed forces, and when in 1976 he was demobilized and went to the Computer Applications Research Institute of the Chengdu Branch of the Chinese Academy of Sciences, he had only a low level of education. In 1978 he was sent to Nankai University to major in automatic control. Summoning up an artilleryman's vigor, he redoubled his efforts and broke through one difficulty after another to complete his studies. In 1980 he graduated and returned to the institute, where he was assigned to Laboratory 6. Since then, computers have crossed his path.

The head of laboratory No 6, Lu Fuzhi 4151 4395 2535, told us that within only 2 years after Zhang graduated he achieved two scientific research results and was twice rated an advanced worker and a superior CPC member of the institute and the CAS branch.

Zhang says shyly, "It was nothing: I did it all with the help of my older comrades."

He told us that in May and June 1981, Laboratory No 6 imported a microcomputer and he chose the research topic, "An Intelligent Interface." An interface is used to interconnect a variety of devices. It is a new technology developed abroad in the late 1970's and is subject to foreign patents; the software in particular is still kept from us by embargo. What to do? As the comrades in Laboratory 6 repeatedly discussed the problem, like a newborn bull calf which does not fear the tiger, Zhang blurted out, "Foreign patents were made by people; we should imitate that advanced experience and

proceed on the basis of China's conditions, taking the matter into our own hands." Thereupon, the laboratory leaders gave him the task of software research.

But it was easier said than done. The knowledge that Zhang had acquired at school was inadequate, and in addition he had not had a formal introduction to computers. He was rather tense. At this time the laboratory chief and Engineer Shu Zengji, among others, tried to pave the way for him and help him learn microcomputer technology. He both received instruction from his older comrades and immersed himself in the boundless sea of knowledge, to assimilate it.

As a result, within a short time had had gone through more than 10 original microcomputer reports. He also borrowed many Chinese and foreign-language books, studying and experimenting at the same time. He went on for 3 months at a stretch, day and night, and the laboratory became filled with militant atmosphere. Beneath the lamp, he wrote down one code after another, and one program after another. For one experiment he wrote a program more than 120,000 lines long; and the number of experiments was beyond counting. By the end of 1981 he had developed a general-purpose standard interface operating software for a TRS-80 computer. Then he threw himself into the struggle to conquer the intelligent interface for the 7075 digital voltmeter; he converted a program more than 10,000 lines long into 2,000 words of instructions, and entered them into the machine line by line from the keyboard, an arduous undertaking. His hands hurt, his head swam, his eyes were swollen, and everyone tried to persuade him to take a rest, but he kept at it. By May 1982 he achieved his second success.

Laboratory Chief Lu Fuzhi repeatedly said to us, "We need more young men like this!"

Now there is a new task on Zhang's desk, that of developing an automatic monitoring system for the looms in a cotton textile mill. The world of computers is vast and uncharted, but Zhang is striding forward into it.

8480  
CSO: 4008/117

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### CHINESE SCIENTIST PUBLISHES MAJOR PAPERS IN CRYSTAL PHYSICS

Chengdu SICHUAN RIBAO in Chinese 12 Apr 83 p 1

Article: "Middle-Aged Professor Zhao Minguang Writes Several Important Scientific Articles"

Text Forty-nine year old professor in the Sichuan Normal Academy Physics Department Zhao Minguang [6392 2404 0342] recently received a letter from the United States journal PHYSICAL REVIEW announcing that two important research articles which he and his associates had written entitled "The Effect of High Pressure on the EPR [Electron Paramagnetic Resonance] Spectrum of Ruby" and "Paired-Center Transitions in Iron Carbonate" would be published. In the 5-odd years since the Third Plenum of the 11th Central Committee, Zhao Minguang has published 25 articles in Chinese and foreign academic journals, including more than ten major research articles, and has attracted widespread attention in among physicists in China and abroad. In the last 2 years, five international academic conferences have invited him to participate and to present papers.

Prof. Zhao's papers "The d-Orbital Function Theory of the Ruby," "Some Doubts About the Theory of Zero-Field Splitting in the Electron Paramagnetic Resonance Spectrum of Ruby," "The d-Orbital Theory of Manganese Ions in Crystals," and "Paired-Center Transitions in Iron Carbonate" have been regarded by British and United States physicists as "explaining a great many experiments," "showing astonishing numerical agreement between theoretical simulations and actual values," "being a universally applicable complete calculation method for transition metal ions," and "leading to new development in a field which had been somewhat stagnant"; critics in some domestic publications have said that "they may break new paths in quantum mineralogy in China."

After some of Zhao Minguang's articles were published in SCIENTIA SINICA and eminent foreign academic periodicals, physicists from 13 countries, including Poland, Australia, Canada, England and the United States wrote to ask for his data. An eminent German professor wrote, "I am going to present a report on the state of world research on high pressures at an international high-pressure conference; please send me your paper to enable me to present a good report." Before the 21st International Conference on Magnetism opened, a Canadian scientist wrote to Prof. Zhao asking for a copy of the paper he was going to present.

Prof. Zhao's research on the theory of fields in crystals has made rather profound achievements. His effective theory dealing with ions of the transition metal chromium is closely related to the people's livelihood, geology, environment, biology, physics, chemistry, and national defense. When the paper "The d-Orbital Function Theory of the Manganese Ion," which he wrote using this theory, was published in the English JOURNAL OF PHYSICS in 1982, some countries immediately made use of it. A British scientist recently wrote to him, "Zero-field splitting is a difficult problem, and your work offers the possibility of a solution." He then sent a second letter which said, "I have achieved excellent results using your coefficients," and "I intended to further investigate the relationship between the Zhao d-orbital function and other models."

Since 1980, Prof. Zhao has also been training graduate students. His first two graduate students graduated last year and were awarded the M. A. degree. He now has five more graduate students.

8480  
CSO: 4008/117

## Chemistry

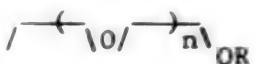
AUTHOR: CHENG Dekai [4453 1795 0418]  
LI Shusen [2621 2885 2773]  
LU Huixiu [7120 1920 4423]  
et al.

ORG: All of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences

TITLE: "Synthesis of a New Type of Macrocyclic Polyether--1, 7-N, N'-Disubstituted 1, 7-Diaza-4, 10, 13-Trioxapentadecane"

SOURCE: Shanghai YOUJI HUAXUE [ORGANIC CHEMISTRY] in Chinese No 3, Jun 83 p 210

TEXT OF ENGLISH ABSTRACT: Preparation of 1, 7-disubstituted, 1, 7-diaza-4, 10, 13-trioxacyclopentadecane (3a-d), where the substitution group is d, is described.



### 1. The synthesis of 3a-d

- 1) Synthesis of the side chains  $\text{Br} \text{---} \backslash \text{O} / \text{---} \text{OR}$  see scheme 2 in previous paper.
- 2) Synthesis of the mother ring 1, 7-diaza-4, 10, 13-trioxacyclopentadecane (abbreviated as [2.1]) was achieved by condensation of the sodium salt of

[Continuation of YOUJI HUAXUE No 3, Jun 83 p 210]

N, N'-ditosyl 1, 2(2-aminoethoxy) ethane with diethylene glycol ditosylate, and reduction of the cyclization product in liquid ammonia (Scheme 2).

### 2. The synthesis of the N, N'-disubstituted [2.1]

Four ligands were prepared according to the Scheme 3. The purification of the final products was achieved by the same procedure that was described in the previous paper except that the high vacuum distillation step was omitted and the residue after removal of chloroform was further extracted by heptane. The improved method gave higher purity and yields of final products (yields > 50 percent).

### 3. The characteristics of the mass spectra of macrocyclic polyethers

Scheme 4 indicates the pattern of the bond fission in the mass spectrum process, and Table 2 shows the distribution and the relative strength of various ions formed in the mass spectrum condition. Obviously, the rupture of bonds is not at random: the N-C bonds are more stable than are the C-O and C-C bonds; the bonds between C<sub>9</sub> and C<sub>10</sub> of C<sub>9</sub>-C<sub>10</sub>-X (X=O or N) are liable to fission; and the side chains are less stable than the bonds that existed in the mother ring. By using this regularity of susceptibility toward fission of various bonds, the mass spectrum method may be used to identify the purity of the macrocyclic polyethers. The reaction intermediates, such as the ligands of the

[Continuation of YOUJI HUAXUE No 3, Jun 83 p 210]

monosubstituted side chain, are the impurities found in final products. A small amount of these impurities could not be identified by NMR, but in the case of mass spectrum analysis, the peaks of these impurities are clearly observed and the completeness of the reaction can be judged by this technique.

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ORG: All of the Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences

TITLE: "Study on the Syntheses and Catalytic Activities of Mixed-Metal Clusters"

SOURCE: Shanghai YOUJI HUAXUE [ORGANIC CHEMISTRY] in Chinese No 3, Jun 83

EXCERPT OF ENGLISH ABSTRACT: A new method of synthesizing mixed-metal clusters via phase transfer catalysis is described. The reactions between  $\text{Co}_2(\text{CO})_8$  and  $\text{Pt}[\text{P}(\text{C}_6\text{H}_5)_3]_2\text{Cl}_2$  were investigated. In addition to the cluster  $\text{Pt}_2\text{Co}_2(\mu_2\text{-CO})_3(\text{CO})_5[\text{P}(\text{C}_6\text{H}_5)_3]_2$ , reported in the literature, a new mixed-metal cluster,  $\text{Pt}_3\text{Co}_2(\mu_2\text{-CO})_3(\text{CO})_4[\text{P}(\text{C}_6\text{H}_5)_3]_3$ , and a pentanuclear platinum cluster were also determined.

The cluster  $\text{Pt}_2\text{Co}_2(\mu_2\text{-CO})_3(\text{CO})_5[\text{P}(\text{C}_6\text{H}_5)_3]_2$  was found to possess high catalytic activity for hydroformylation of 1-hexene under mild conditions.

Immunology

AUTHOR: XIAO Zeshuai [5135 3419 1596]  
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ORG: Both of the National Institute for the Control of Pharmaceutical and Biological Products, Beijing

TITLE: "Experimental Studies of a Human Diploid Cell Rabies Vaccine for Human Use"

SOURCE: Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese No 3, 1983 pp 184-187

TEXT OF ENGLISH ABSTRACT: The present report describes a trial production of the  $\beta$ -propiolactone-inactivated human diploid cell rabies vaccine in small lots using a fixed rabies virus CTN-1-HDCS strain which has been adapted to human diploid cells.

The dispersed human diploid cells (HDC) were inoculated and mixed with CTN-1-HDCS virus and incubated at 37°C. On day 3 when a confluent monolayer was formed, the cell sheets were washed once with Earle's salt solution and the nutrient medium was replaced by a medium for vaccine production (Eagle's medium supplemented with 0.07 percent globin, 0.25 percent human albumin, sodium bicarbonate and kanamycin). The cells were then transferred to 33°C for further incubation. Harvest of the virus fluid commenced from day 7 and then the

[Continuation of ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI No 3, 1983 pp 184-187]

subsequent four to five harvests were obtained at intervals of 48 or 72 hours while the cells still remained alone. The inoculum/medium ratio could be reduced to 1/100 - 1/1000 when the HDC were infected with the CTN-1-HDCS seed virus, with the titre higher than 4.5 ic log LD<sub>50</sub>/0.03 ml. Both 2BS and KMB-17 cell lines of HDC were suitable for the production of the vaccine.  $\beta$ -propiolactone used for inactivation of the vaccine was at a final concentration of 1:6,000 and the incubation was at 1-4°C for 16-18 hours and then at 37°C for another hour in a water bath. The vaccine produced in this way passed the safety test. Using Habel's test, the protection index of the fluid vaccine preparation was more than 10,000 and that of the Al(OH)<sub>3</sub>-adjuvanted vaccine preparation was approximately 100,000.

9717  
CSO: 4009/205

Industrial Technology

ACQUIS: None

INFO: None

TITLE: "Successful Research and Manufacture of High Energy Efficient Drawing Type Gas Horizontal Flame Burner"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF TSINGHUA UNIVERSITY] in Chinese No 2, 1983 p 94

ABSTRACT: Coal is China's major source of energy and converting coal to gas is currently an important form of coal utilization as well as the main direction of future coal use in industrial furnaces. The injection type vertical flame burning nozzle is now being used in many Chinese factories. Its gas consumption is high while the furnace temperature is too low for many work processes. For the purpose of overcoming these shortcomings, the Engineering Mechanics Department of Tsinghua University, in cooperation with the Design Academy No 5 of the Ministry of a Machine-Building Industry, Beijing Automobile General Plant, Tianjin Heavy Machinery Plant, etc. has succeeded in producing the PB model drawing type gas horizontal flame burner. Its energy saving effect is very obvious. Compared with the common vertical flame burners, it saves more than 36 percent in gas; the furnace temperature rises more than twice as fast; the energy saving effect of the temperature maintenance period reaches 30 percent. The

[Continuation of QINGHUA DAXUE XUEBAO No 2, 1983 p 4]

optimization theory of fluid mechanics is applied to utilize the limited pressure energy of gas to draw in the amount of air needed for burning and to cause the flame to take the shape of a round disk. Meanwhile, the heat transfer intensification theory is also used to raise the heat transfer rate inside the furnace. The structural design and the intermediate experimental work of the new furnace underwent technical certification in December 1981. To date, there is no similar design in international patent records.

6748

CSO: 4009/207

Industrial Technology

AUTHOR: SU Liujiān [5685 0362 1017]

ORG: None

TITLE: "National Industrial Boiler Products Information Exchange Meeting Held in Yangzhou"

SOURCE: Shanghai DONGLI GONGCHENG [POWER ENGINEERING] in Chinese No 3, 1983  
p 57

ABSTRACT: A National Industrial Boiler Products Information Exchange Meeting, sponsored by the National Industrial Boiler Information Network, was held on 20-23 April 1983 in Yangzhou, Jiangsu Province. Participating were over 250 delegates representing more than 160 units. Discussions centered upon the current condition and future development trend of industrial boiler products in the country, with the major objectives being determining ways to develop different types of industrial boilers, improving their quality, and raising the economic benefits. Since 1980, 17 types of boiler products designed for Type II bituminous coal of heat values of 3,700-4,700 kcal/kg to meet the needs of users have been added. It was proposed that starting in 1984 steam boilers should no longer be used to provide heat and hot water and hot water boilers of various capacities should be quickly studied and produced to serve these purposes.

6248

CSO: 4009/206

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QIANG Boqin [1730 0130 0530]  
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ORG: All of the Institute of Basic Medical Sciences, Beijing

TITLE: "Study on Vectors of Cloning System in *Bacillus subtilis*.  
I. Recombination of Hybrid Plasmids pHE1-a and pHE1-b"

SOURCE: Beijing ZHONGGUO YIXUE KEXUEYUAN XUEBAO [ACTA ACADEMIAE MEDICINAE SINICAE] in Chinese No 3, 1983 pp 139-145

TEXT OF ENGLISH ABSTRACT: The construction *in vitro* of hybrid plasmids of EcoRI-linearized plasmid pUB110 of *B. subtilis* and *E. coli* plasmid pBR322 digested by EcoRI, was described and named pHE1-a and pHE1-b respectively. Under electron microscopy, they were found to be covalently closed circular DNA molecules. The maps obtained by analyzing with restriction enzymes EcoRI, BamHI, SgII, XbaI, HindIII and PstI indicated that these two recombinant plasmids were similar in size but opposite in linking orientation. Agarose gel electrophoresis showed their molecular weights to be about  $5.6 \times 10^6$  daltons. The detection of resistance to antibiotics of strains transformed revealed that the ampicillin and tetracycline resistance from *E. coli* could not be expressed in *B. subtilis*, but kanamycin and neomycin

[Continuation of ZHONGGUO YIXUE KEXUEYUAN XUEBAO No 3, 1983 pp 139-145]

resistance carried by *B. subtilis* could be expressed in both hosts. Since these two hybrids are replicatable in both *E. coli* and *B. subtilis*, they can be used as cloning vectors in both bacteria.

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HAN Rui [7281 6904]  
SUN Zhenrong [1327 2182 2837]

ORG: WU, FANG and ZUO all of the Institute of Basic Medical Sciences; HAN and SUN both of the Institute of Materia Medica

TITLE: "Epiharringtonine Induced Enhancement of Harringtonine Inhibition on Protein and DNA Synthesis in Tumor Cells"

SOURCE: Beijing ZHONGGUO YIXUE KEXUEYUAN XUEBAO [ACTA ACADEMIAE MEDICINAE SINICAE] in Chinese No 3, 1983 pp 157-160

TEXT OF ENGLISH ABSTRACT: It has been found that the inhibitory action of harringtonine on DNA and protein synthesis was enhanced by the addition of epiharringtonine into tumor cell culture, while synthesis of RNA was not affected. The enhancement of inhibition on protein synthesis was more pronounced than that of DNA synthesis and it increased with the increase of time, reaching its maximum value in 45 min. The reversibility of the inhibitory action of harringtonine was not changed by epiharringtonine. The action of isoharringtonine was also enhanced by epiharringtonine. This indicates that the action of epiharringtonine has no specificity. However, it could not change an inactive drug-cephalotonine into an active one. The mechanism of epiharringtonine action is discussed.

9717  
CSO: 4009/203

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TITLE: "A Patho-morphological Study of the Kidneys from Severe Burn Patients"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S LIBERATION ARMY] in Chinese No 3, 1983 pp 161-164

TEXT OF ENGLISH ABSTRACT: The kidneys of 17 severe burn patients were studied histologically and ultrastructurally. The glomeruli exhibited conspicuous and consistent morphological changes. They were characterized by: (a) enlargement of capillary endothelial cells associated with increased amount of cytoplasm and hypertrophy of rough endoplasmic reticulum; (b) hyperplasia and hypertrophy of mesangial cells showing well-developed RER; (c) aggregation of neutrophils or monocytes in capillary lumens. Thus, capillary loops became narrowed or obliterated, resulting in glomerular ischemia. These changes are referred to as acute glomerulopathy. The renal tubules showed various degrees of degeneration, necrosis and cast formation.

Correlation analysis indicated that the degree and extent of acute glomerulopathy

[Continuation of JIEFANGJUN YIXUE ZAZHI No 3, 1983 pp 161-164]

are parallel to the severity of azotemia. It was proposed that glomerular lesions might be the main cause of renal dysfunction.

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ORG: All of the Third Military Medical College, Chongqing

TITLE: "Ultrastructural Changes of Bone Marrow Megakaryocytes in Certain Injuries"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S LIBERATION ARMY] in Chinese No 3, 1983 pp 175-179

TEXT OF ENGLISH ABSTRACT: Seventy-one dogs were used in this study. Among these, 24 suffered from burn-blast combined injury inflicted at a nuclear test ground. Twelve, eighteen and twelve dogs were inflicted with burn, blast injury and burn-blast combined injury respectively, and all of these were produced in the laboratory. Five animals served as the control. Bone marrow tissues were examined with LM and EM. Peripheral blood platelets were counted. The outstanding changes of the marrow megakaryocytes in the injured animals were degeneration and phagocytosis (by granulocytes). It was found that the granulocytes invaded the megakaryocytes, and they seemed to consume the intracellular components of the latter by three methods of the phagocytotic process:

[Continuation of JIEFANGJUN YIXUE ZAZHI No 3, 1983 pp 175-179]

(1) Invagination of cell membrane, ingestion of megakaryocytic components and formation of phagosomes. (2) Release of lysosomal content (enzymes) into the megakaryocytes. (3) Discharge of lysosome granules into the megakaryocytes. The "megakaryocytophagia in bone marrow," as described in previous communications, was further confirmed in this study. It is also proved that the neutrophilic granulocytes participate in the autophagocytosis reaction in the body. The megakaryocytophagia plays the main role in the elimination of the degenerated megakaryocytes in the marrow. The process as mentioned is considered to be one of the important factors responsible for the decrease in number and impairment of the function of the platelets in these injuries.

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et al.

ORG: All of the Surgery Research Institute, Third Military Medical College,  
Chongqing

TITLE: "Short-term Effects of No 2 Fluorocarbon Blood Substitute in Rabbit  
Hemorrhagic Shock"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [MEDICAL JOURNAL OF CHINESE PEOPLE'S  
LIBERATION ARMY] in Chinese No 3, 1983 pp 184-186

TEXT OF ENGLISH ABSTRACT: Rabbits were bled to a systolic pressure of 40 mmHg  
in 15 minutes, and this blood pressure was maintained for 60 minutes. Then an  
equal amount of No 2 fluorocarbon blood substitute was rapidly infused in the  
experimental group. The hematocrit was further made to fall to 4-6 percent by  
exchanging the blood with the blood substitute at a rate of 4 ml/min. The  
experimental group had a longer mean survival time ( $16.12 \pm 3.08$  hr) when com-  
pared with the control group which received 4 percent hydroxyethyl starch  
instead of fluorocarbon ( $9.70 \pm 11.40$  hr). The 12 hr survival rate was higher  
in the former group than in the latter (6/7 vs 3/8). The final blood pressure  
was  $67 \pm 8.9$  mmHg for rabbits receiving the fluorocarbon blood substitute, and

[Continuation of JIEFANGJUN YIXUE ZAZHI No 3, 1983 pp 184-186]

$58 \pm 14.8$  mmHg for rabbits receiving 4 percent hydroxyethyl starch. Arterial  
 $PO_2$  was significantly higher in the fluorocarbon group than in the  
hydroxyethyl starch group ( $459.2 \pm 59.2$  vs  $247.3 \pm 122.2$  mmHg). It was  
revealed by EKG that all the eight control rabbits had cardiомuscular anoxia,  
while only one of seven fluorocarbon rabbits had this abnormal change.

Our results showed that the infusion of No 2 fluorocarbon blood substitute can  
improve the hemodynamic state, and it seemed to carry more oxygen to tissues  
to maintain aerobic metabolism. The elimination of carbon dioxide is  
satisfactory. The perspective of its clinical application is favorable.

9717  
CSO: 4009/217

Metallurgical Industry

AUTHOR: WAN Jiali [8001 0857 4409]

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TITLE: "Symposium on the Adoption of International and Foreign Advanced Standards in Metallurgy Held in Beijing"

SOURCE: Shanghai DONGLI GONGCHENG [POWER ENGINEERING] in Chinese No 3, 1983  
p 55

ABSTRACT: The Ministry of Metallurgical Industry called a symposium in Beijing on 5-16 March 1983 to discuss the adoption of international and foreign standards in metallurgy. The symposium was attended by more than 150 representatives of the Ministries of Machine-Building, Chemical Industry, and Nuclear Industry. To discuss the systems and the names of standards and to draft the standards, the symposium was divided into groups which dealt with stainless, heat resistant steel, spring steel, bearing steel, high speed tool steel, etc. During the symposium, the state General Standards Bureau invited individual users for a conference to solicit their opinions regarding standardization work. In view of the close relationship between metallurgical standards and machine products, following the conclusion of the symposium, a meeting was held between the Science and Technology Department of the Ministry of Machine-Building Industry and the participants of the symposium to discuss problems and procedures of coordination with respect to the adoption of international and advanced foreign standards in metallurgy.

6248

CSO: 4009/206

Microbiology

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ZHANG Nailin [1728 0035 5259]

ORG: YE and LI both of the Institute of Chinese Materia Medica, Academy of Traditional Chinese Medicine, Beijing; FU and LIU both of the Central Laboratory, Academy of Traditional Chinese Medicine, Beijing; GAO, CHEN and ZHANG all of the National Vaccine and Serum Institute, Beijing

TITLE: "Ultrastructure of *P. falciparum* in Continuous Culture *In Vitro*"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 83 pp 175-178

TEXT OF ENGLISH ABSTRACT: The ultrastructure of intraerythrocytic stage of *P. falciparum*, Hainan strain, in continuous culture *in vitro* was examined by electron microscopy. The results indicated that the fine structures of different developmental stages of the Hainan strain were the same as those of the other strains of *P. falciparum*. It had some ultrastructural characteristics of the mammalian plasmodia, such as a nucleus without a nucleolus and pigment

[Continuation of WEISHENGWU XUEBAO No 2, Jun 83 pp 175-178]

grains being rectangular and crystalline in shape. However, on the other hand, it also had some similarities to the avian plasmodia in its ultrastructure, including the food vacuole, which was bigger and had digestive functions, and the mitochondria containing some typical microtubular cristae. So, the intraerythrocytic stage of *P. falciparum* is morphologically a unique mammalian malarial parasite. Generally, two morphological changes of infected host cells were observed: elongated Maurer's clifts appeared in the cytoplasm and the knob-like protrusion lying underneath the erythrocytic membrane.

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LI Yuhua [2621 3768 5478]  
HAN Shumin [7281 3219 2404]  
ZHANG Nailin [1728 0035 5259]

ORG: LONG and YE both of the Department of Parasitology, Guangxi Medical College, Nanning; GAO, LI, HAN and ZHANG all of the National Vaccine and Serum Institute, Beijing

TITLE: "Application of the *In Vitro* Cultivation of Erythrocytic Stages of *Plasmodium falciparum* in the Screening of Sensitive Animals as Malarial Model"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, Jun 83 pp 179-182

TEXT OF ENGLISH ABSTRACT: An attempt was made to use the petri dish candle jar method of cultivation of erythrocytic stages of *Plasmodium falciparum* to screen sensitive animals. The medium used was RPMI 1640 with 25 mM Hepes buffer, to which 15 percent rabbit serum was added. Red blood cells obtained from a *Hylobates lar*, a *Nycticebus coucang* and a *Macaca mulatta* were tested separately. The experiment showed that only the erythrocytes of the *Hylobates lar* were susceptible to the FCC<sub>1</sub>/HN, FCC<sub>2</sub>/HN and Cambodian strains of *P. falciparum*, the

[Continuation of WEISHENGWU XUEBAO No 2, Jun 83 pp 179-182]

density of the parasites being as high as over 12 percent in three to four days of cultivation. The animal, which was then inoculated with the culture material containing its own blood and parasites of the FCC<sub>1</sub>/HN strain, showed a patent parasitemia for 38 days. A peak of 11.6/10<sup>6</sup> RBC was reached in the second week of parasitemia. The erythrocytes of the *Nycticebus coucang* and *Macaca mulatta* were proved to be refractory to *P. falciparum* by both *in vivo* tests and *in vitro* culture methods. The results of this preliminary experiment indicated that the technique of *in vitro* continuous cultivation of *P. falciparum* might be a feasible method for the screening of sensitive animals as malarial models.

9717  
CSO: 4009/216

Natural Sciences

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ORG: All of Fudan University

TITLE: "Solvent Extraction of Uranium (IV) from Hydrochloric Acid with Neutral Phosphate"

SOURCE: Shanghai FUDAN DAXUE XUEBAO (ZIRAN KEXUE BAN) [FUDAN JOURNAL (NATURAL SCIENCE)] in Chinese No 2, 1983 pp 133-138

TEXT OF ENGLISH ABSTRACT: The solvent extraction of uranium (IV) from hydrochloric acid with tributylphosphate (TBP) and trioctylphosphine oxide (TOPO) in cyclohexane has been investigated. The effect of uranium concentration, extractant concentration, hydrochloric acid concentration and lithium chloride concentration on the extraction of uranium (IV) was examined. The uranium/TBP(TOPO) ratio was determined in the extracted species and the experiment showed that the ratio is 1:2. The extraction reactions may be summarized as follows:



where B = TBP, TOPO and their equilibrium constants have been calculated.

AUTHOR: XU Tai [1776 3141]

ORG: Fudan University

TITLE: "A Method for Determining the Total Scattering Matrix of the Cascading 6-Port Microwave Networks"

SOURCE: Shanghai FUDAN DAXUE XUEBAO (ZIRAN KEXUE BAN) [FUDAN JOURNAL (NATURAL SCIENCE)] in Chinese No 2, 1983 pp 213-220

TEXT OF ENGLISH ABSTRACT: An alternative method for determining the total scattering matrix  $[S]_{total}$  of the cascading 6-port microwave networks has been developed in the present work.

In the first part of the paper, the cascading matrix  $[C]$  is introduced. Because of its characteristics,  $[C]$  can be used as a medium in calculating  $[S]_{total}$ . The converting relations between the matrix elements of  $[S]$  and  $[C]$  are summarized and the calculating steps of the method outlined.

The problem of cascading two symmetrical 6-port 2-branch line couplers is analyzed and discussed in the second part of the paper as an application example.

Oncology

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TITLE: "Studies of Influence on CHO Cell Cytokinetics by Harringtonine Using Premature Chromosome Condensation and Clone Production Methods"

SOURCE: Beijing ZHONGHUA ZHONGLIU ZAZHI [CHINESE JOURNAL OF ONCOLOGY] in Chinese No 4, Jul 83 pp 256-258

TEXT OF ENGLISH ABSTRACT: Chromosome damage in interphase may be visualized by the method of premature chromosome condensation (PCC). Chinese hamster ovary (CHO) cells were treated with harringtonine, and fused with cells in the M phase with the aid of polyethylene glycol (PEG). The results indicated that damage in the G<sub>2</sub>-PCC was predominant. Many aberrations, such as chromosome breaks, gaps, fragments, pulverization and rings, appeared. The extent of chromosome damage observed in PCC was proportional to the dose of the drug. Cells were treated with harringtonine during G<sub>1</sub>, S, G<sub>2</sub> and M phases and then clone production was made separately. The results demonstrated that the cells in the G<sub>1</sub> and S phase were most sensitive to harringtonine with the next being G<sub>2</sub> phase cells, and the M phase cells were the least sensitive.

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TITLE: "A Study of the Transformations Between Stationary and Transit Domains in a Gunn Device"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 4, Jul 83 pp 321-333

TEXT OF ENGLISH ABSTRACT: The transformations between stationary and transit domains in a Gunn device which has a  $n^+ - n - n^+$  sandwich structure with a doping gradient near the anode are investigated. Experimental observation and computer simulation are carried out. When the domain reaches the anode, it will stop and become a quasi-stationary domain. By this time the field outside the domain reaches its maximum value. If the bias voltage is not high enough and this maximum value of the field outside the domain does not cause a new domain to be created at the notch near the cathode, the quasi-stationary domain will then readjust itself to become a real stationary domain while the field outside the domain will decrease to a fixed value, independent of the bias voltage. Theoretical analysis has been carried out and an analytical relationship

[Continuation of BANDAOTI XUEBAO No 4, Jul 83 pp 321-333]

between the field outside the domain for real stationary domains and the doping density in the active region of the device is obtained. If the bias voltage increases, the maximum value of the field outside the domain, which is accompanied by the quasi-stationary domain, increases too. As soon as this maximum value becomes high enough to cause a new domain to be created at the notch, the stationary domain mode will transform into the transit domain mode. It is noticed that the maximum value of the field outside the domain depends not only on the instantaneous value, but also on the increasing rate of the bias voltage. If the bias voltage increases further, the rear part of the quasi-stationary domain will extend over the notch near the cathode, and a new stationary domain will occur again. This state will be maintained until the avalanche takes place. The influence of the diffusion coefficient on stationary domain and the temperature dependence of the threshold voltages of the two kinds of transformation between stationary and transit domains are also discussed.

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TITLE: "Computer Simulation of Oscillation Characteristics of 10 GHz CW GaAs Gunn Devices"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 4, Jul 83 pp 351-360

TEXT OF ENGLISH ABSTRACT: A one-dimensional computer simulation of oscillation characteristics has been carried out on 10GHz GaAs Gunn diodes. This paper describes the fundamental equations, boundary conditions and calculation sequence in the computer simulation, and presents the influence exerted on the oscillation characteristics of devices by the operating temperature, the thickness and doping distribution of the active layer, as well as the donor concentration gradient near the boundary surface.

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